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Method of increasing the reliability of telemetric well information transmitted by the wireless communication channel

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Abstract

© 2018 Tomsk Polytechnic University, Publishing House. All rights reserved. The relevance of the research is caused by the need to obtain reliable information about the state of oil wells equipped with sucker rod pumps. As a rule, telemetric devices are lowered into wells on a special logging cable, which provides power, control and transmission to the surface of the information about the relevant parameters of the operating mode of the wells and the surrounding rocks where data are recorded and processed. In the wells equipped with sucker rod pumps the packer insulating equipment is used that prevents the cable telemetry systems, so the information has to be transferred over wireless communication channels. It is the known fact that with increasing depth of productive oil reservoir the reliability electromagnetic channel is reduced. As a solution to the problem of providing oil companies with reliable information on the status of the well, there are different approaches: Variation between the power transmitter and the frequency of reception-transmission (low to low), provision of independent power supply with long operating life (e.g., batteries Tadiran lithium cells SL2790 T (DD)), etc. And what to do if solenoid channel is relatively stable, and the information on the reception is still distorted? In this case, one should get the increase of reliability of the received information. One approach is the use of error-correcting coding of information, where the codes non-positional arithmetic in residual classes are applied instead of traditional coding in a positional number system. This article proves that the system of residual classes has better correction capabilities and is able not only to detect errors but to correct them. The main aim of the research is to increase the reliability of the information transmitted via the wireless communication channel by detecting and correcting errors in the system of redundant coding of signals. Objects: Fault-tolerant computing structures of digital signal processing of wireless telemetry systems, functioning in the basis of algorithms of modular arithmetic. Methods are based on the use of the mathematical modeling methods, the mathematical apparatus of number theory, coding theory with the estimation of the reliability of surface information obtained on the surface based on comparison of calculated and actual parameters of temperature, pressure, water content in the mixture and production rate. Results. By detecting and correcting errors that occur during the reception and transmission of telemetric information, a significant increase in the reliability of the reception is achieved, which ultimately allows a more qualitative conduct of a hydrodynamic study of an oil well equipped with a sucker-rod deep-well pump.

Keywords

Coding, Corrective abilities, Error detection and correction, Oil wells, Residual class system, Telemetry information, Wireless electromagnetic channel

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